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(19)



(54) PRINTING INK CONTAINING A WAX FOR
 PRINTING MATERIAL IN SHEET FORM

(71) We, BASF AKTIENGESELL-
 SCHAFT, a German Joint Stock Company
 of 6700 Ludwigshafen, Federal Republic of
 Germany, do hereby declare the invention,
 for which we pray that a Patent may be
 granted to us and the method by which it is
 to be performed, to be particularly de-
 scribed in and by the following statement:-

The present invention relates to the print-
 ing of materials in sheet form with a printing
 ink containing a wax, and to the printing ink
 itself.

The addition of a small amount of
 polyethylene wax to printing inks, in order
 to obtain prints of improved scuff resist-
 ance, has been disclosed. The polyethylene
 wax is added to the printing inks in the form
 of a dispersion in toluene or gasoline.
 However, it is not possible to use the
 conventional polyethylene wax dispersions
 for aqueous inks, eg. for aqueous flexog-
 raphic inks and gravure inks, because the
 wax dispersions are not miscible with these
 printing inks. It is true that aqueous wax
 dispersions can also be employed, but the
 emulsifier content of the dispersion has an
 adverse effect on print quality. Further-
 more, aqueous wax dispersions are immis-
 cible with printing inks which contain orga-
 nic solvents.

The present invention seeks to provide a
 wax dispersion which can be added both to
 aqueous printing inks and to printing inks
 based on organic solvents, eg. ethanol, ethyl
 acetate, toluene or gasoline.

According to the invention there is pro-
 vided printing ink containing from 0.5 to 5%
 by weight, based on its solids content, of an
 oxidized polyethylene wax which has been
 added to the printing ink in the form of a
 dispersion in diethylene glycol mono-n-
 butyl ether (= butyldiglycol), the dispersion
 having been obtained by dissolving the
 oxidized polyethylene wax in the glycol
 ether at elevated temperature, and cooling

the solution. The invention further provides
 a process for printing material in sheet form
 with a printing ink, wherein a printing ink
 according to the invention is used.

Oxidized polyethylene waxes are com-
 mercially available. They may be obtained
 by oxidizing polyethylenes manufactured
 from ethylene by high pressure or low
 pressure polymerization. The molecular
 weight of the oxidized polyethylene waxes is
 suitably from 1,000 to 12,000, preferably
 from 2,000 to 6,000. The oxidized
 polyethylene waxes suitably have an acid
 number of from 10 to 30, preferably from 15
 to 25.

Butyldiglycol is also commercially avail-
 able. Examples of methods of manufacture
 of the dispersion of the oxidized
 polyethylene wax in butyldiglycol are to mix
 the oxidized polyethylene wax and butyldig-
 lycol at room temperature and heat and
 mixture until the wax dissolves, or to add
 solid oxidized polyethylene wax to the
 heated butyldiglycol. On cooling, the oxi-
 dized polyethylene wax separates out from
 the clear solution in the form of fine
 crystals. The dispersion can be homoge-
 nized by means of a high-speed stirrer or an
 Ultra-Turrax apparatus (ULTRA-
 TURRAX is a Registered Trade Mark). To
 achieve optimum dispersion, it is at times
 advantageous to subject the dispersion of
 the oxidized polyethylene wax in butyldigly-
 col to an after-treatment in a ball mill or
 similar machine.

In order to dissolve the oxidized
 polyethylene wax, the butyldiglycol is as a
 rule heated at from 105 to 150°C. Prefer-
 ably, the wax is dissolved in butyldiglycol at
 from 110 to 120°C. It is possible to manufac-
 ture dispersions of oxidized polyethylene
 waxes in butyldiglycol which have a solids
 content of from 5 to 40% by weight.

From 0.5 to 5% by weight, preferably
 from 2 to 4% by weight, of the oxidized

polyethylene wax, based on the solids content of the printing inks, are added to the latter. The polyethylene wax dispersions may be added to printing inks based on aqueous solvents or on organic solvents. The preferred use of the dispersions of the oxidized polyethylene wax in butyldiglycol is as an additive to aqueous flexographic inks and gravure inks. These inks are also commercially available. Because of the more stringent requirements of environmental protection, and also for cost reasons, the use of aqueous flexographic inks and gravure inks has in recent times gained great importance. These inks are used to produce prints on material in sheet form, for example paper, wallpaper, plastic films, eg. films of polyolefins, especially polyethylene and polypropylene, polyesters and polyamides, and metal foils, eg. aluminum foil. Particularly scuff-resistant prints are obtained by adding a dispersion of oxidized polyethylene waxes in butyldiglycol. This property is of importance in, for example, the printing of magazines, catalogues and packaging materials.

The Example which follows illustrates the invention. In the Example, parts and percentages are by weight.

EXAMPLE

30 parts of an oxidized polyethylene wax which has a molecular weight of 3,950 (determined by melt viscometry) and an acid number of 27, were dissolved in 70 parts of butyldiglycol at 150°C. whilst stirring. On cooling the clear solution to about 98°C, the oxidized polyethylene wax separated out as fine crystals. The dispersion obtained was after-treated in a ball mill for 7 minutes. 2%, in each case based on solids, of the resulting stable dispersion of the oxidized polyethylene wax in butyldiglycol were added to the flexographic and gravure inks shown below. Prints were then produced with these printing inks on a great diversity of materials:

a) Aqueous flexographic printing ink consisting of 10 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 88 parts of a binder solution comprising 25% of a commercial phthalic acid ester resin which is free from fatty acids, 3.3% of 25% strength ammonia, 1.7% of butanol and 70% of water. The aqueous flexographic ink is used to print paper, parchment and board.

b) Aqueous wallpaper printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 40% of an ammonia-neutralized commercial thermoplastic acrylate resin dissolved in a 2:1 mixture of i-propanol and

water, and 60% of water. The aqueous printing ink thus obtained is used to print wallpapers.

c) Packaging printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 14.4% of nitrocellulose A 400, 3.1% of dibutyl phthalate, 20% of ethyl acetate, 3% of ethylglycol and 59% of ethanol. The printing ink thus obtained is used to print paper, aluminum foils and regenerated cellulose films.

d) Packaging printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine, and 90 parts of a binder solution comprising 30% of a commercial polyamide resin based on dimerized fatty acids and diamines, 40% of n-propanol and 30% of gasoline (boiling range 100 - 140°C). The printing ink obtained is used to print high and low pressure polyethylene films and polypropylene films.

e) Illustration gravure printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine and 90 parts of a binder solution comprising 40% of a phenol-modified rosin and 60% of toluene.

f) Illustration gravure printing ink consisting of 8 parts of an organic pigment based on a commercial blue copper phthalocyanine and 90 parts of a binder solution comprising 50% of zinc resinate and 50% of gasoline of boiling range 100-140°.

The printing inks described under e) and f) are employed for printing illustrated magazines and catalogs.

WHAT WE CLAIM IS:

1. Printing ink containing from 0.5 to 5% by weight, based on its solids content, of an oxidized polyethylene wax, which has been added to the printing ink in the form of a dispersion in diethylene glycol mono-n-butylether, the dispersion having been obtained by dissolving the oxidized polyethylene wax in the glycol ether at elevated temperature and cooling the solution.

2. Printing ink as claimed in claim 1, wherein an oxidized polyethylene wax which has a molecular weight of from 1,000 to 12,000 and an acid number of from 10 to 30 is employed.

3. Printing as claimed in claim 1 or 2, wherein from 2 to 4% by weight of oxidized polyethylene wax, based on the solids content of the printing ink, are employed.

4. Printing ink as claimed in any of claims 1 to 3, wherein a dispersion of an oxidized polyethylene wax in the glycol ether which has a solids content of from 5 to 40% by weight is employed.

5. Printing ink as claimed in any of

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- claims 1 to 4 which is a water-based ink.
6. Printing ink as claimed in claim 5, which is an aqueous flexographic or gravure ink.
- 5 7. Printing ink as claimed in any of claims 1 to 4 which is based on ethanol, ethyl acetate, toluene or gasoline.
8. Printing ink as claimed in claim 1 and substantially as described in the foregoing Example.
- 10 9. A process for printing material in sheet form with a printing ink, wherein a printing ink as claimed in any of claims 1 to 8 is employed.
10. Paper, wallpaper, plastics films and metal foils which have been printed by a process as claimed in claim 9. 15
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